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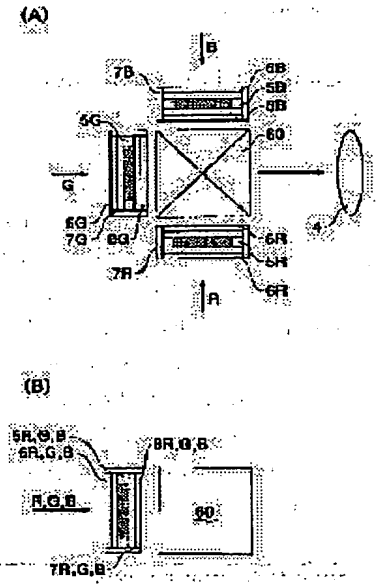
(54) PROJECTION TYPE DISPLAY DEVICE

(57)Abstract:

PROBLEM TO BE SOLVED: To prevent the degradation of optical characteristics of a liq. crystal panel caused by the heat generation of a polarizing plate in a projection display device and depositing contamination on a light-emitting surface.

SOLUTION: Polarizing plates 8R, 8G and 8B are provided on the side of a light-emitting surface of liq. crystal panels 5R, 5G and 5B, and polarizing plates 6R, 6G and 6B are provided on the side of a light incident surface of the liq. crystal panels. Two polarizers provided on the liq. crystal panel and on the side of a light incidence and emission surface are held by contaminant preventing member's 7R, 7G and 7B. Degradation of an optical characteristic of the liq. crystal panel can be prevented by these constitutions and further deposition of contaminant on a light-emitting surface of light bulve is prevented. Therefore, a high quality picture excellent in contrast is projected.



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CLAIMS

[Claim(s)]
[Claim 1] It is the projection mold display which a polarizing plate is arranged at the optical outgoing-radiation side side of said light modulation element in the projection mold display which has the light modulation element which modulates the light injected from the light source corresponding to image information, and the projection means which carries out expansion projection of the light modulated by this light modulation element on a projection side, and is characterized by to be intercepted by the dust prevention member with the exterior between polarizing plates and the optical outgoing-radiation sides of said light modulation element concerned.
[Claim 2] The projection mold display characterized by arranging a polarizing plate also at the optical plane-of-incidence side of said light modulation element, and between the polarizing plates concerned and optical plane of incidence of said light modulation element being intercepted by said dust prevention member with the exterior in claim 1.
[Claim 3] It is the projection mold display which the polarizing plate is arranged at the optical plane-of-incidence side of said light modulation element, and a transparence plate is arranged in claim 1 between the polarizing plates concerned and optical plane of incidence of said light modulation element, and is characterized by being intercepted by said dust prevention member with the exterior between the transparence plates concerned and optical plane of incidence of said light modulation element.
[Claim 4] It is the projection mold display which a polarizing plate is arranged at the optical plane-of-incidence side of said light modulation element in the projection mold display which has the light modulation element which modulates the light injected from the light source corresponding to image information, and the projection means which carries out expansion projection of the light modulated by this light modulation element on a projection side, and is characterized by to be intercepted by the dust prevention member with the exterior between the polarizing plate concerned and the optical plane-of-incidence side of said light modulation element.
[Claim 5] Said polarizing plate arranged in claim 2 thru/or the term of either of 4 at the optical plane-of-incidence side of said light modulation element is a projection mold display characterized by being the thing of a reflective mold.
[Claim 6] A color separation means to divide into two or more colored light the light injected from said light source in claim 1 thru/or the term of either of 5, Said two or more light modulation elements which modulate each colored light corresponding to image information, and a color composition means to compound each colored light modulated by these light modulation elements, It is the projection mold display characterized by being fixed to the optical plane of incidence of said color composition means in the removable condition while it has said projection means which carries out expansion projection of the light compounded by this color composition means on a projection side and said dust prevention member holds said light modulation element and said polarizing plate.

[Translation done.]

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention modulates the light injected from the light source by the light modulation element corresponding to image information, and relates to the projection mold display which carries out expansion projection of the light after a modulation on a projection side through a projection means.

[0002]

[Description of the Prior Art] Fundamentally, the projection mold display consists of a light source unit, an optical unit optically processed so that the color picture corresponding to image information for the flux of light by which outgoing radiation was carried out from here can be compounded, and a projection lens which carries out expansion projection of the flux of light compounded here on a screen.

[0003] Drawing 14 (A) is the outline block diagram of an optical unit and a projection lens among each above-mentioned component. As shown in this drawing, the optical system of the optical unit 3 The light source 20 included in a light source unit, and the color separation optical system 40 which separates into each colored light R, G, and B of red (R), green (G), and blue (B) in three primary colors the flux of light W by which outgoing radiation was carried out from this light source 20, It has the liquid crystal panels (light modulation element) 5R, 5G, and 5B of three sheets which modulate each separated colored light corresponding to image information, the cross dichroic prism 60 which compounds each modulated colored light, and the projection lens 4 which carries out expansion projection of the compounded light at a screen 120. The flux of light W by which outgoing radiation was carried out from the light source 20 is separated into each colored light R, G, and B by the color separation optical system 40 equipped with various kinds of dichroic mirrors, and outgoing radiation of the red light R and the green light G is carried out among each colored light towards the liquid crystal panels 5R and 5G which correspond from each outgoing radiation section prepared in the color separation optical system 40. Blue glow B is led to liquid crystal panel 5B which corresponds through the light guide optical system 50.

[0004] Polarizing plates 100R, 100G, and 100B are arranged at the optical plane-of-incidence side of each liquid crystal panels 5R, 5G, and 5B, and he is trying to arrange the plane of polarization of each colored light which carries out incidence to liquid crystal panels 5R, 5G, and 5B with these polarizing plates 100R, 100G, and 100B in the optical unit 3 so that it may expand to drawing 14 (B) and (C) and may be shown. Moreover, polarizing plates 110R, 110G, and 110B are arranged also at the outgoing radiation side side of each liquid crystal panels 5R, 5G, and 5B, and he is trying to arrange the plane of polarization of each colored light after [which carries out incidence to the cross dichroic prism 60 with these polarizing plates 110R, 110G, and 110B] becoming irregular. The projection image excellent in contrast can be projected now on the front face of a screen 120 according to an operation of these polarizing plates. The polarizing plates 110R, 110G, and 110B located in the optical outgoing radiation side side of a liquid crystal panel between two polarizing plates which sandwich each liquid crystal panels 5R, 5G, and 5B are stuck on the optical outgoing radiation side of a corresponding liquid crystal panel, respectively.

[0005] In addition, the common polarizing plate has structure which carried out the laminating of the protective layer to the polarizer which consists of dichroism matter, such as an iodine system or organic dye. Moreover, generally the liquid crystal equipment of the active-matrix mold which controls the pixel arranged in the shape of a matrix by the switching element as a liquid crystal panel is used.

[0006]

[Problem(s) to be Solved by the Invention] It is effective to stick a polarizing plate with the sufficient selection property of polarization light in the optical outgoing radiation side of each liquid crystal panels 5R, 5G, and 5B for accumulating the contrast of the image by which expansion projection is carried out on a screen 120 for improving here. However, the polarizing plate which is excellent in a selection property has so much absorption of light, therefore there is much calorific value. In the projection mold display mentioned above, although airstream as shown in the interior of equipment at drawing 14 (C) is formed and a polarizing plate is cooled by this airstream, since direct attachment of the polarizing plate is carried out in the optical outgoing radiation side of a liquid crystal panel, heat transfer to a liquid crystal panel is high, and the temperature of a liquid crystal panel tends to rise. By this temperature rise, the optical property of a liquid crystal panel will deteriorate and aggravation of the contrast of a projection image will be caused.

[0007] Then, it is possible to separate a polarizing plate from the optical outgoing radiation side of a liquid crystal panel, and to arrange it. However, in having separated the polarizing plate from the optical outgoing radiation side simply, and having arranged it, by the airstream formed in the interior of equipment, dust etc. will adhere to the optical outgoing radiation side of a liquid crystal panel, and the image quality of a projection image will be reduced.

[0008] Without causing degradation of the optical property of a light modulation element in view of the above-mentioned point, moreover, the technical problem of this invention prevents dirt adhesion in the optical outgoing radiation side of a light modulation element, and is to offer the projection mold display which can project a high-definition image.

[0009]

[The means for solving invention] In order to solve the above-mentioned technical problem, in the projection mold display of this invention In the projection mold display which has the light modulation element which modulates the light injected from the light source corresponding to image information, and the projection means which carries out expansion projection of the light modulated by this light modulation element on a projection side A polarizing plate is arranged to the optical outgoing radiation side side of said light modulation element, and it is characterized by intercepting between this polarizing plate and the optical outgoing radiation sides of said light modulation element with the exterior by the dust prevention member.

[0010] Since it is intercepted by the dust prevention member from the outside between a polarizing plate and the optical outgoing radiation side of a light modulation element, among these, an air space consists of projection mold displays of this invention. Therefore, generation of heat of the polarizing plate transmitted to a light modulation element will be reduced by this air space. For this reason, even if it used the polarizing plate which was excellent in the selection property, the temperature rise of the light modulation element resulting from generation of heat of a polarizing plate can be controlled, and degradation of the optical property of the light modulation element concerned can be prevented beforehand.

[0011] Moreover, since it is intercepted with the exterior between a polarizing plate and a light modulation element, even if dust, dust, etc. are spread by the airstream formed in the interior of equipment, dust etc. does not invade among them. For this reason, it can prevent that dust etc. adheres to the optical outgoing radiation side of a light modulation element.

[0012] Therefore, according to the projection mold display of this invention, without causing degradation of the optical property of a light modulation element, moreover, dirt adhesion in the optical outgoing radiation side of a light modulation element is prevented, and the high-definition image which was excellent in contrast on the projection side can be projected.

[0013] When a polarizing plate is arranged also at the optical plane of incidence of a light modulation element, it is desirable to intercept between the polarizing plate and optical plane of incidence of a light modulation element with the exterior by said dust prevention member. If it does in this way, it is effective by also being able to prevent dirt adhesion in the optical plane of incidence of a light modulation element, and projecting a high-definition image.

[0014] Moreover, when the transparence plate is arranged between the polarizing plates arranged at the optical plane-of-incidence and optical plane-of-incidence side of a light modulation element, it is desirable to intercept between a transparence plate and the optical plane of incidence of a light modulation element with the exterior by said dust prevention member. If it does in this way, since the air space and transparence plate between a transparence plate and a light modulation element will intervene between a polarizing plate and a light modulation element, generation of heat of the polarizing plate (polarizing plate arranged at the optical plane-of-incidence side of a light modulation element) transmitted to a light modulation element can be reduced more. Moreover, it can prevent dust adhering to the optical plane of incidence of a light modulation element.

[0015] What is necessary is here, just to intercept between the polarizing plates concerned and optical plane of incidence of said light modulation element with the exterior by the dust prevention member in the situation that dust etc. tends to adhere to the optical plane-of-incidence side of a light modulation element by the airstream formed in the interior of equipment.

[0016] The polarizing plate of the reflective mold which reflects the polarization light of not only a polarizing plate but another side which has the property in which penetrate polarization light and while being used generally absorbs the polarization light of another side as a polarizing plate can be used. Since there is little absorption of light, the polarizing plate of a reflective mold also has little calorific value. For this reason, if the polarizing plate of a reflective mold is used, the temperature rise of a light modulation element can be controlled more. Moreover, it can prevent irradiating a light modulation element with the light reflected with the polarizing plate, then polarizing plate of a reflective mold in the polarizing plate arranged at the optical plane-of-incidence side of a light modulation element, and malfunction of the light modulation element resulting from the light reflected with the polarizing plate can be prevented beforehand.

[0017] The projection mold display of this invention is applicable also to the projection mold display not only using

the projection mold display of a veneer method using an independent light modulation element but two or more light modulation elements. That is, it is the projection mold display which has a color separation means to divide into two or more colored light the light injected from the light source, said two or more light modulation elements which modulate each colored light corresponding to image information, a color composition means to compound each colored light modulated by these light modulation elements, and said projection means which carries out expansion projection of the light compounded by this color composition means on a projection side.

[0018] While holding said light modulation element and said polarizing plate by the dust prevention member in the case of such a projection mold display, it is desirable to fix the dust prevention member concerned to the optical plane of incidence of said color composition means in the removable condition. If it does in this way, since it is not necessary to touch a light modulation element soon and to perform anchoring by the side of a color composition means, it can prevent that a light modulation element interferes in other parts, and damages or suffers a loss. Moreover, exchange of a light modulation element can be performed easily.

[0019]

[Embodiment of the Invention] Below, the gestalt of operation of this invention is explained with reference to a drawing. In addition, in the following explanation, especially, as long as there is no explanation, the direction of Y and the direction of 3:00 are made [the travelling direction of light] into the direction of X for the direction of 12:00, in view of a Z direction and a Z direction.

[0020] Drawing 1 is the outline top view showing the configuration of the projection mold display of this invention. This projection mold display 1 is equipped with the light source unit 2, the optical unit 3, and the projection lens 4.

[0021] The optical unit 3 is equipped with the integrator optical system 30 which has the 1st optical element 31, 2nd optical element 32, and superposition lens 33. Moreover, it has the color separation optical system 40 containing dichroic mirrors 41 and 42 and the reflective mirror 43. Furthermore, it has the light guide optical system 50 containing the incidence side lens 51, a relay lens 52, and the reflective mirrors 53 and 54. Moreover, it has the field lenses 61, 62, and 63 of three sheets, the liquid crystal panels 5R, 5G, and 5B of three sheets, and the cross dichroic prism 60.

[0022] The light source unit 2 is arranged at the plane-of-incidence side of the 1st optical element 31 of the optical unit 3. The projection lens 4 is arranged at the optical outgoing radiation side side of the cross dichroic prism 60 of the optical unit 3.

[0023] Drawing 2 is the explanatory view showing the integrator illumination-light study system which illuminates the liquid crystal panel of three sheets which is the lighting field of the projection mold display shown in drawing 1 . This integrator illumination-light study system is equipped with the light source 20 with which the light source unit 2 was equipped, and the integrator optical system 30 with which the optical unit 3 was equipped. The integrator optical system 30 is equipped with the 1st optical element 31, 2nd optical element 32, and superposition lens 33. The 2nd optical element 32 is equipped with a condenser lens 34, a gobo 35, and the polarization sensing-element array 36. In addition, drawing 2 shows only the main components for explaining the function of an integrator illumination-light study system in order to give explanation easy.

[0024] The light source 20 is equipped with the light source lamp 21 and a concave mirror 22. the beam of light (synchrotron orbital radiation) of the radial injected from the light source lamp 21 is reflected with a concave mirror 22 — having — abbreviation — it is injected in the direction of the 1st optical element 31 as an parallel bundle of rays. As a light source lamp 21, a halogen lamp, a metal halide lamp, and a high-pressure mercury lamp are used in many cases. As a concave mirror 22, it is desirable to use a parabolic mirror.

[0025] Drawing 3 is the front view and side elevation showing the appearance of the 1st optical element 31. The 1st optical element 31 is the lens array by which the minute small lens 311 which has a rectangle-like profile was arranged by M lines in the lengthwise direction, and was arranged in the shape of [of 2N train] MATORISUKU in the longitudinal direction. From a lens longitudinal direction core, N train existence is recognized leftward N train and rightward. In this example, it is M= 10 and N= 4. The appearance configuration where each smallness lens 311 was seen from the Z direction is set up so that an analog may be mostly made with the configuration of a liquid crystal panel 5. For example, if the aspect ratio (ratio of the dimension of length and width) of the image formation field of a liquid crystal panel is 4:3, the aspect ratio of each smallness lens 311 will also be set as 4:3.

[0026] The condenser lens 34 of the 2nd optical element 32 is the lens array of the same configuration as the 1st optical element 31. In addition, the sense of the lens of the 1st optical element 31 and a condenser lens 34 may turn to whichever of + Z direction or - Z direction. Moreover, a direction which is mutually different as shown in drawing 2 may be turned to.

[0027] As the polarization sensing-element array 36 is shown in drawing 2 , two polarization sensing-element

arrays 361 and 362 are arranged on both sides of the optical axis at the symmetrical sense. Drawing 4 is the perspective view showing the appearance of the polarization sensing element 361. This polarization sensing element 361 is equipped with the polarization beam splitter array 363, and the lambda / 2 phase-contrast plate 364 (the slash in drawing shows) arranged alternatively in a part of optical outgoing radiation side of the polarization beam splitter array 363. As for the polarization beam splitter array 363, the cross section has the configuration on which two or more translucency members 365 of the shape of a column of a parallelogram were stuck one by one, respectively. The polarization demarcation membrane 366 and the reflective film 367 are formed in the interface of the translucency member 365 by turns. lambda / 2 phase-contrast plate 364 is alternatively stuck on a part for the mapping division of the direction of X of the injection side of the light of the polarization demarcation membrane 366 or the reflective film 367. In this example, lambda / 2 phase-contrast plate 364 is stuck on a part for the mapping division of the direction of X of the injection side of the light of the polarization demarcation membrane 366.

[0028] The polarization sensing-element array 361 has the function to change into one kind of linearly polarized light light (for example, S polarization light and P polarization light) the flux of light by which incidence was carried out, and to inject it. Drawing 5 is the explanatory view showing the function of the polarization sensing-element array 361. The unpolarized light light (incident light which has the random polarization direction) which contains S polarization component and P polarization component in the plane of incidence of a polarization sensing element carries out incidence. This incident light is first separated into S polarization light and P polarization light by the polarization demarcation membrane 366. S polarization light is injected, after it is reflected almost perpendicularly by the polarization demarcation membrane 366 and being further reflected by the reflective film 367. On the other hand, P polarization light penetrates the polarization demarcation membrane 366 as it is. In the injection side of P polarization light which penetrated the polarization demarcation membrane 366, lambda / 2 phase-contrast plate 364 is arranged, and this P polarization light is changed into S polarization light, and injects. Therefore, the most serves as S polarization light, and the light which passed the polarization sensing element is injected. Moreover, what is necessary is just to make it arrange to the injection side where S polarization light reflected by the reflective film 367 injects lambda / 2 phase-contrast plate 364 to make into P polarization light. light injected from a polarization sensing element.

[0029] In addition, it can be further considered including one adjacent polarization demarcation membrane 366 and one adjacent reflective film 367 that the block which consists of one lambda / a 2 phase-contrast plate 364 is one polarization sensing element 368. As for the polarization sensing-element array 361, two or more arrays of such a polarization sensing element 368 are carried out in the direction of X. It is constituted from the polarization sensing element 368 of four trains by this example.

[0030] Since the polarization sensing-element array 362 is completely the same as that of the polarization sensing-element array 361, explanation is omitted.

[0031] Drawing 6 is the top view of a gobo 35. The gobo 35 has the configuration which formed opening 351 in the abbreviation rectangle-like plate so that light may carry out incidence only to the optical plane of incidence corresponding to the polarization demarcation membrane 366 among the plane of incidence of the light of two polarization sensing elements 361 and 362.

[0032] An unpolarized light light injected from the light source 20 shown in drawing 2 is condensed near the polarization demarcation membrane 366 of two polarization sensing-element arrays 361 and 362 while being divided into two or more partial flux of lights 202 by two or more small lenses 341 of the condenser lens 34 contained in two or more the 1st small lens 311 and 2nd optical element 32 of an optical element 31 which constitute the integrator optical system 30. Especially the condenser lens 34 has the function drawn so that two or more partial flux of lights 202 injected from the 1st optical element 31 may be condensed on two polarization demarcation membranes 366 of the polarization sensing-element arrays 361 and 362. It is changed into one kind of linearly polarized light light, and two or more partial flux of lights 202 which carried out incidence to two polarization sensing-element arrays 361 and 362 are injected, as mentioned above. Two or more partial flux of lights injected from two polarization sensing-element arrays 361 and 362 are superimposed on the liquid crystal panel 5 (5R, 5G, 5B) later mentioned with the superposition lens 33. Thereby, this integrator optical system 30 can illuminate a liquid crystal panel 5 to homogeneity.

[0033] In the projection mold display 1 shown in drawing 1 , the reflective mirror 56 is formed in order to draw the flux of light injected from the superposition lens 33 in the direction of the color separation optical system 40. Depending on the configuration of an illumination-light study system, it does not necessarily need.

[0034] The color separation optical system 40 is equipped with the dichroic mirrors 41 and 42 of two sheets, and

has the function to divide into the colored light of red and three green and blue colors the light injected from the superposition lens 33. The 1st dichroic mirror 41 reflects a blue glow component and a green light component while making a part for red Mitsunari penetrate among the light injected from the superposition lens 33. It is reflected by the reflective mirror 43 and the red light R which penetrated the 1st dichroic mirror 41 reaches liquid crystal panel 5R for red through the field lens 61. This field lens 61 changes into the parallel flux of light each partial flux of light injected from the superposition lens 33 to that medial axis (chief ray). The same is said of the field lenses 62 and 63 prepared before other liquid crystal panels 5G and 5B.

[0035] Among the blue glow B reflected with the 1st dichroic mirror 41, and green light G, it is reflected by the 2nd dichroic mirror 42 and green light G amounts to liquid crystal panel 5G for green through the field lens 62. On the other hand, blue glow B penetrates the 2nd dichroic mirror 42, passes along the light guide optical system 50 51, i.e., an incidence side lens, the reflective mirror 53, a relay lens 52, and the reflective mirror 54, and reaches liquid crystal panel 5B for blue glow through the field lens 63 further. In addition, since the die length of the optical path of blue glow B is longer than the die length of the optical path of other colored light, the light guide optical system 50 is used for blue glow B for preventing decline in the use effectiveness of the light by optical diffusion etc. That is, it is for telling the field lens 62 with the partial flux of light which carried out incidence to the incidence side lens 51.

[0036] Three liquid crystal panels 5R, 5G, and 5B have the function as a light modulation element modulated according to the image information which was able to give the light which carried out incidence. Thereby, according to the given image information, it becomes irregular, and each colored light which carried out incidence to three liquid crystal panels 5R, 5G, and 5B forms the image of each colored light.

[0037] Incidence of the modulation light of three colors injected from three liquid crystal panels 5R, 5G, and 5B is carried out to the cross dichroic prism 60. The cross dichroic prism 60 has the function as a color composition means to compound the modulation light of three colors and to form a color picture. The dielectric multilayers which reflect the red light R in the cross dichroic prism 60, and the dielectric multilayers which reflect blue glow B are formed in the interface of four rectangular prisms in the shape of an abbreviation X character. The modulation light of three colors is compounded by these dielectric multilayers, and a synthetic light for projecting a color picture is formed. A synthetic light generated with the cross dichroic prism 60 is injected in the direction of the projection lens 4. The projection lens 4 has the function which projects this synthetic light on a projection screen, and displays a color picture on a projection screen.

[0038] Drawing 7 (A) and (B) are the enlarged drawings of liquid crystal panels 5R, 5G, and 5B and the circumference part of those. As shown in these drawings, each liquid crystal panels 5R, 5G, and 5B set the remaining side face (three optical plane of incidence) except the injection side of the cross dichroic prism 60, and predetermined spacing, and are arranged. Each liquid crystal panels 5R, 5G, and 5B are the postures which intersect perpendicularly to the optical path of each colored light R, G, and B. Polarizing plates 6R, 6G, and 6B are arranged at the optical plane-of-incidence side of each liquid crystal panels 5R, 5G, and 5B, respectively, and polarizing plates 8R, 8G, and 8B are arranged also at the optical outgoing radiation side side, respectively.

[0039] The polarizing plates 6R, 6G, and 6B arranged at the optical plane-of-incidence side of each liquid crystal panel have the function to absorb polarization light (this example P polarization light), respectively, and to carry out incidence of the colored light R, G, and B with little mixing of P polarization light to liquid crystal panels 5R and 5G while being mixed in each colored light R, G, and B. Each colored light R, G, and B will turn into light (S polarization light) of P polarization light contained in each colored light to which all were mostly removed and plane of polarization was mostly equal, if polarizing plates 6R, 6G, and 6B are passed. Consequently, linearly polarized light light with a sufficient precision with little mixing of other polarization light carries out incidence to each liquid crystal panels 5R, 5G, and 5B.

[0040] The polarizing plates 8R, 8G, and 8B arranged at the optical outgoing radiation side side of each liquid crystal panel absorb a part for one polarization Mitsunari from each colored light R, G, and B modulated with each liquid crystal panels 5R, 5G, and 5B, and have the function to make only a part for polarization Mitsunari of another side penetrate. Each modulated colored light R, G, and B will turn into light to which plane of polarization was mostly equal, if polarizing plates 8R, 8G, and 8B are passed.

[0041] Here, in the projection mold indicating equipment 1 of this example, the polarizing plates 6R and 8R arranged at the optical optical plane-of-incidence [of liquid crystal panel 5R and this light valve 5R] and outgoing radiation side side are held by dust prevention member 7R. This dust prevention member 7R is intercepting between the optical plane of incidence of liquid crystal panel 5R, and polarizing plate 6R, and between liquid crystal panel 5R, an optical outgoing radiation side, and polarizing plate 8R with the exterior, and constitutes

the air space among these. In addition, liquid crystal panel 5B liquid crystal panel 5G for green light, polarizing plates 6G and 8G, and for blue glow and the polarizing plates 6B and 8B as well as liquid crystal panel 5R for red light and polarizing plates 6B and 8B are held by the dust prevention members 7G and 7B, respectively, and the air space is constituted between the liquid crystal panel and the polarizing plate.

[0042] Next, the structure of a dust prevention member is explained to a detail. In addition, since each dust prevention member is the same configuration, it explains on behalf of dust prevention member 7R for red light. Drawing 8 is the outline cross-section block diagram of dust prevention member 7R. An outline flat-surface block diagram when drawing 9 looks at dust prevention member 7R from an optical plane-of-incidence side, and drawing 10 are the outline flat-surface block diagrams when seeing from an optical outgoing radiation side side.

[0043] As shown in these drawings, polarizing plate 6R is arranged through a cushion 87 at the optical plane of incidence of liquid crystal panel 5R, and polarizing plate 8R is arranged through the cushion 88 in the optical outgoing radiation side. In this example, liquid crystal panel 5R and the polarizing plates 6R and 8R which have such an arrangement relation are held by dust prevention member 7R.

[0044] Dust prevention member 7R is equipped with the cheek middle flask 75 which intercepts with the exterior between liquid crystal panel 5R and the 1st and 2nd outer frames 73 and 74 which pinch polarizing plates 6R and 8R, and the optical outgoing radiation sides of liquid crystal panel 5R and polarizing plate 8R, and between the optical plane of incidence of liquid crystal panel 5R, and polarizing plate 6R. It is held after liquid crystal panel 5R and polarizing plates 6R and 8R have been sandwiched by the 1st and 2nd outer frames 73 and 74.

[0045] The 1st outer frame 73 equips 4 rounds with perimeter wall 73b of fixed thickness while being equipped with rectangle opening 73a for optical passage. 4 rounds is equipped with perimeter wall 74b of fixed thickness while the 2nd outer frame 74 is also equipped with rectangle opening 74a for optical passage. The 2nd outer frame 74 is set up smaller than the 1st outer frame 73.

[0046] A cheek middle flask 75 is a rectangle frame, and is formed in liquid crystal panel 5R and the condition of enclosing the periphery of polarizing plates 6R and 8R. It has set on the side face of this cheek middle flask 75, and engagement projection 75a is formed in the location on either side which is two places, respectively. On the other hand, engagement hole 73c which can insert these in is formed in the location corresponding to each engagement projection 75a at the 1st outer frame 73.

[0047] Moreover, engagement projection 75b is formed in the location of each two right and left in the side face of a cheek middle flask 75. On the other hand, engagement hole 74c which can insert these in is formed in the location corresponding to each engagement projection 75b at the 2nd outer frame 74.

[0048] Therefore, from the outside of polarizing plate 6R established in the optical plane-of-incidence side of liquid crystal panel 5R, so that each engagement projection 75a may be inserted in each engagement hole 73c From the outside of polarizing plate 8R which pushes in the 1st outer frame 73 to a cheek middle flask 75, and is established in the optical outgoing radiation side side of liquid crystal panel 5R, so that each engagement projection 75b may be inserted in each engagement hole 74c If the 2nd outer frame 74 is pushed in to a cheek middle flask 75, liquid crystal panel 5R and polarizing plates 6R and 8R will be held by dust prevention member 7R. Moreover, between the optical plane of incidence of liquid crystal panel 5R and polarizing plate 6R and between liquid crystal panel 5R, an optical outgoing radiation side, and polarizing plate 8R are intercepted with the exterior. In addition, the member prolonged towards the upper part from dust prevention member 7R is flexible cable 76R for wiring.

[0049] Thus, in the projection mold display 1, between the optical outgoing radiation side of liquid crystal panel 5R and polarizing plate 8R arranged at this optical outgoing radiation side side is intercepted by dust prevention member 7R with the exterior, and the air space is formed among them. Thus, since an air space intervenes, generation of heat of polarizing plate 8R transmitted to liquid crystal panel 5R will be reduced. That is, compared with the case where polarizing plate 8R is soon attached in the optical outgoing radiation side of liquid crystal panel 5R, the thermal load which joins liquid crystal panel 5R can be eased. Therefore, even when what was excellent in the selection property of polarization light as a polarizing plate is used, the temperature rise of liquid crystal panel 5R can be controlled, and degradation of the optical property of the liquid crystal panel 5R concerned can be avoided. In addition, degradation of the optical property of the other liquid crystal panels 5G and 5B as well as liquid crystal panel 5R is avoidable.

[0050] Moreover, even if dust, dust, etc. are spread by the airstream formed in the interior of equipment in order to cool polarizing plate 8R since it is intercepted with the exterior between the optical outgoing radiation side of liquid crystal panel 5R, and polarizing plate 8R, the dust etc. does not invade between the optical outgoing radiation side of liquid crystal panel 5R, and polarizing plate 8R. For this reason, it can prevent that dust etc.

adheres to the optical outgoing radiation side of liquid crystal panel 5R. Moreover, the light modulated by liquid crystal panel 5R is not scattered about with the dust between the optical outgoing radiation side of liquid crystal panel 5R, and polarizing plate 8R etc. In addition, it can prevent that dust etc. adheres like liquid crystal panel 5R to the optical outgoing radiation side of the other liquid crystal panels 5G and 5B.

[0051] Therefore, since degradation of the optical property of the liquid crystal panel resulting from generation of heat of a polarizing plate can be prevented and dirt adhesion in the optical outgoing radiation side of a liquid crystal panel can be prevented, the high-definition image excellent in contrast can be projected.

[0052] Moreover, in the projection mold display 1, between the polarizing plate arranged at the optical plane-of-incidence side of a liquid crystal panel and the optical plane of incidence concerned is intercepted by the dust prevention member with the exterior. For this reason, since generation of heat of the polarizing plate arranged at the incidence side of a liquid crystal panel can also reduce extent transmitted to a liquid crystal panel, the temperature rise of a liquid crystal panel can be controlled further. Moreover, it can prevent that dust etc. adheres to the optical plane of incidence of a liquid crystal panel, and the image quality of a projection image can be raised more.

[0053] In addition, the number of sheets of the polarizing plate arranged to the incidence side of a liquid crystal panel may not be limited to one sheet, and may be two or more sheets. Thus, since calorific value per polarizing plate can be lessened by arranging two or more polarizing plates, each polarizing plate can be efficiently cooled by the airstream formed in equipment. If it puts in another way, the thermal load which joins a liquid crystal panel can be reduced more.

[0054] Signs that liquid crystal panel 5R and dust prevention member 7R holding polarizing plates 6R and 8R are attached in optical plane-of-incidence 60R of the cross dichroic prism 60 are shown in drawing 11 . The structure for attaching dust prevention member 7R in optical plane-of-incidence 60R of the cross dichroic prism 60 with reference to this drawing is explained.

[0055] As shown in drawing 11 , dust prevention member 7R holding liquid crystal panel 5R etc. is fixed to optical plane-of-incidence 60R of the cross dichroic prism 60 through the middle frame board 81 to the fixed frame plate 82 by which adhesion immobilization is carried out. In addition, the red filter 83 is stuck on optical plane-of-incidence 60R of the cross dichroic prism 60 of this example.

[0056] The middle frame board 81 is almost the same as that of the 1st outer frame 73 of dust prevention member 7R, or is the rectangle frame formed somewhat more greatly than this, and is equipped with rectangle opening 81a for optical passage. 81d of engagement protruding pieces prolonged perpendicularly is formed in the four corners of that rectangle opening 81a from the frame board front face at this middle frame board 81. On the other hand, 73d of engagement holes in which a plug is possible is formed in the location corresponding to 81d of each engagement protruding piece in these at the dust prevention member 7R side. 73d of each engagement hole is constituted from the through tube formed in the 1st outer frame 73 and cheek middle flask 75 of dust prevention member 7R, respectively by this example. Therefore, if 81d of each engagement protruding piece of the middle frame board 81 is set and it lays on top of 73d of each engagement hole of dust prevention member 7R mutually, the condition with possible eye tacking that 81d of each engagement protruding piece was inserted in 73d of each engagement hole will be formed.

[0057] On the other hand, the fixed frame plate 82 is also a frame board of the rectangle in which rectangle opening 82a for optical passage was formed. Moreover, rectangle opening 82a currently formed in the fixed frame plate 82 is formed smaller than the optical outgoing radiation side of polarizing plate 8R. The fixed frame plate 82 is fixed to the red filter 83 prepared in optical plane-of-incidence 60R of the cross dichroic prism 60 by adhesives.

[0058] **** hole 82c is formed in the mid gear of the longitudinal direction of both the corners of the cope box part of the fixed frame plate 82, and the drag flask part of the fixed frame plate 82. It ****s also to the middle frame board 81 corresponding to these three screw-threads hole 82c, and hole 81c is formed. The middle frame board 81 is fixed to the corresponding **** holes 81c and 82c to the fixed frame plate 82 by inserting a flat countersunk head screw 84, respectively. In addition, in this example, the middle frame board 81 is being fixed to the fixed frame plate 82 with three screw threads 84. Without being limited, the number of a screw thread may be four or more, and may be two or less. Generally there is so little routing of **** conclusion that there are few numbers, and manufacture becomes easy.

[0059] Here, engagement projection 82b is formed in right-and-left both the corners of the drag flask part of the fixed frame plate 82, and engagement hole 81b is formed in right-and-left both the corners of the drag flask part of the middle frame board 81 corresponding to these two engagement projection 82b. Therefore, if it faces fixing according to **** 84, engagement hole 81b of the middle frame board 81 is doubled to engagement projection 82b

of the fixed frame plate 82 and the middle frame board 81 is stuffed into the fixed frame plate 82 side, it can tacking do of the middle frame board 81 to the fixed frame plate 82. If it does in this way, the positioning accuracy of a mutual frame board can be raised further.

[0060] In the projection mold display 1 of this example, it has the positioning means for positioning dust prevention member 7R to the middle frame board 81 fixed to the fixed frame plate 82. This positioning means is equipped with two wedges 85. The wedge slideways 73e–73g which inclined plane 85a of this wedge 85 contacts are formed in the mid gear of the vertical direction of the right–and–left both–sides side of dust prevention member 7R: When it carries out [tacking] of the dust prevention member 7R to the middle frame board 81, a wedge plug slot is constituted between parts for wedge slideway 73e and the frame part of the middle frame board 81 which stand face to face against this. Therefore, if two wedges 85 are driven into right and left of dust prevention member 7R and the amount of pushing of these wedges 85 is adjusted after tacking carrying out of the dust prevention member 7R to the middle frame board 81, the location of dust prevention member 7R is specified, and liquid crystal panel 5R currently held at dust prevention member 7R can be positioned.

[0061] Next, the procedure of attaching dust prevention member 7R in optical plane–of–incidence 60R of the cross dichroic prism 60 is explained. First, liquid crystal panel 5R and dust prevention member 7R by which polarizing plates 6R and 8R were held are prepared. Moreover, the cross dichroic prism 60 with which the red filter 83 was stuck on optical plane–of–incidence 60R is prepared. Next, the fixed frame plate 82 is positioned in the red filter 83 fixed to optical plane–of–incidence 60R of the cross dichroic prism 60, and adhesion immobilization is carried out. Ultraviolet curing mold adhesives etc. can be used as adhesives.

[0062] Next, the middle frame board 81 is positioned on the front face of the fixed frame plate 82 which carried out adhesion immobilization, and the stop of the middle frame board 81 concerned is ****ed and carried out to it with three flat countersunk head screws 84. After an appropriate time, dust prevention member 7R by which liquid crystal panel 5R etc. is held is positioned to the middle frame board 81, and carries out [tacking] there. That is, 81d of engagement protruding pieces of the middle frame board 81 is made in agreement with 73d of engagement holes of dust prevention member 7R, and dust prevention member 7R is turned and stuffed into the middle frame board 81 in this condition. In addition, before carrying out adhesion immobilization of the fixed frame plate 82 at the cross dichroic prism 60, if the fixed frame plate 82 and the middle frame board 81 are ****ed and it unifies beforehand by 84, it will be easy to take out location precision.

[0063] After this, liquid crystal panel 5R is positioned to optical plane–of–incidence 60R of the cross dichroic prism 60, using a wedge 85 as a positioning means. That is, two wedges 85 are inserted along with wedge slideway 73e formed in dust prevention member 7R between dust prevention member 7R by which it is tacking carried out, and the middle frame board 81. And alignment adjustment and focal adjustment of liquid crystal panel 5R are performed by adjusting the amount of plugs of each wedge 85.

[0064] In the place whose positioning was completed, adhesion immobilization of these wedges 85 is carried out at dust prevention member 7R and the middle frame board 81 which are a member for positioning using adhesives. In this case, the adhesives of an ultraviolet curing mold can be used also as adhesives to be used.

[0065] Here, positioning of the above–mentioned wedge 85 and the adhesion fixed activity of a wedge 85 are explained in more detail according to process sequence.

[0066] First, the focal field of liquid crystal panel 5R is doubled using the adjusting device of dedication in the focal side of the projection lens 4. In this condition, as above–mentioned, the adhesives of an ultraviolet curing mold are poured into the clearance which goes into 73d of engagement holes of dust prevention member 7R, and is formed, 81d of engagement protruding pieces of the middle frame board 81 makes it harden, and they carry out temporary immobilization by UV irradiation. Next, by the middle frame board 81 and wedge slideway 73e prepared in dust prevention member 7R, ultraviolet rays are irradiated, ultraviolet curing mold adhesives are pasted from the exposure end face of a wedge 85, and this immobilization is performed. Focal adjustment of liquid crystal panels 5R and 5B and mutual pixel doubling adjustment are similarly carried out on the basis of liquid crystal panel 5G arranged in the center of liquid crystal panels 5R, 5G, and 5B, and temporary immobilization and this immobilization are performed.

[0067] Since the attaching structure to the cross dichroic prism 60 of liquid crystal panels 5G and 5B other than liquid crystal panel 5R is also the same structure, the explanation is omitted.

[0068] The following effectiveness will be acquired if dust prevention member 7R is attached in the cross dichroic prism 60 as mentioned above.

[0069] Since liquid crystal panel 5R has the part of the four peripheries in the condition of having been protected by dust prevention member 7R, it does not need to touch liquid crystal panel 7R directly, and does not need to

perform anchoring by the side of the cross dichroic prism 60 to the 1st. Therefore, it can prevent that liquid crystal panel 5R carries out in other parts etc., and damages or suffers a loss. Moreover, since the perimeter of liquid crystal panel 5R is covered with dust prevention member 7R, outdoor daylight can be intercepted and malfunction of liquid crystal panel 5R resulting from outdoor daylight can be prevented.

[0070] It ****s through the middle frame board 81 to optical plane-of-incidence 60R of the cross dichroic prism 60, and the stop of the dust prevention member 7R which held liquid crystal panel 5R to the 2nd is carried out, and it is removable. When it follows, for example, a deficit occurs in liquid crystal panel 5R, the easy activity of removing **** 84 can perform the exchange. Since adhesion immobilization of the liquid crystal panel 5R is not directly carried out to the cross dichroic prism 60, moreover, the components of a large sum can be used without futility at the time of such exchange, without damaging the cross dichroic prism 60 side.

[0071] It can tacking carry out of the dust prevention member 7R which held liquid crystal panel 5R to the 3rd to the middle frame board 81. After forming this tacking condition, a wedge 85 can be used and positioning with optical plane-of-incidence 60R of the cross dichroic prism 60 can be performed for liquid crystal panel 5R. Thus, since a tacking condition can be formed, positioning can be easily performed using a wedge 85 at another process, and it ** to the improvement in the cycle time of a facility.

[0072] Here, generally as a wedge 85, a glass thing can be used. However, when dust prevention member 7R is used as resin mold goods, since coefficient of thermal expansion is high compared with glass, that a wedge 85 tends to exfoliate from these frame boards by the difference in thermal expansion, it may become or a wedge 85 may be destroyed by the temperature change. In order to avoid this, it is desirable to use a wedge 85 as resin mold goods, such as acrylic. Moreover, since fabrication is possible by making a wedge 85 into the acrylic quality of the material, as compared with glass material, reduction of cost can be aimed at sharply. In addition, by using the ingredient which makes ultraviolet rays penetrate as a material of a wedge 85, as a binder for carrying out adhesion immobilization of the wedge 85, there are few temperature rises and they can use the short ultraviolet curing mold adhesives of the setting time.

[0073] Moreover, by having formed wedge slideway 73e in dust prevention member 7R, end faces 73f and 73g are formed in the upper and lower sides, and a wedge 85 is guided by these third page. That is, if this part is filled up with adhesives and a wedge 85 is inserted, a wedge 85 will move to the interior automatically with the surface tension of adhesives, showing around by these third page. Therefore, it becomes strong to the disturbance which encounters within a process, and adhesion of a wedge 85 is easy.

[0074] In addition, in this example, although adhesives are used for temporary immobilization of dust prevention member 7R to the middle frame board 81, soldering etc. may instead be used. What is necessary is just to use the thing which stuck the metal member on a part for a joint, or the thing which formed the metallized layer in a part for a joint, when dust prevention member 7R etc. is a product made of resin.

[0075] Next, the above-mentioned dust prevention member 7R, the middle frame board 81, and the fixed frame plate 82 can be used as the mold goods of the resin made from heat curing which mixed glass fiber or a calcium carbonate. If such a resin material is used, the coefficient of thermal expansion will become close to glass compared with a common resin material. For this reason, the image gap which originated in heat deformation in the condition of sticking on the cross dichroic prism 60 is avoidable.

[0076] As the fixed frame plate 82 was mentioned above as adhesives for carrying out adhesion immobilization to the cross dichroic prism 60 here, ultraviolet curing mold adhesives can be used, but in order to raise an adhesive property, it is desirable to apply a surface treatment ingredient. That is, in the cross dichroic prism 60, plane-of-incidence 60R of the red flux of light and plane-of-incidence 60B of a blue glow bundle confront each other. Since wavelength is short, the part may penetrate the reflective film of the cross dichroic prism 60, and a blue glow bundle may result in plane-of-incidence 60R of the red flux of light of the opposite side. Malfunction will be caused if such a backlight carries out incidence to liquid crystal panel 5R. In this example, since the red filter 83 is formed in plane-of-incidence 60R of the red flux of light, such a backlight can be intercepted and malfunction of liquid crystal panel 5R resulting from a backlight can be prevented.

[0077] Although it is because the effect by the backlight of a blue glow bundle is large, when the effect by the backlight of other flux of lights is large, this limitation does not attach a filter only in plane-of-incidence 60R for the red flux of light. A filter may be prepared in other fields or a filter may be prepared in two or more fields.

[0078] However, when such a filter exists, the ultraviolet rays at the time of adhesion immobilization are interrupted by it, and there is a possibility that a part with insufficient UV irradiation may generate the fixed frame plate 82 in the ultraviolet curing mold adhesives for carrying out adhesion immobilization at the plane of incidence 60R, 60G, and 60B of the cross dichroic prism 60. In order to avoid this evil and to carry out adhesion

immobilization of the fixed frame plate 82 certainly at plane-of-incidence 60R, it is desirable to apply a surface treatment ingredient to these adhesion sides and to use aversion type adhesives together as mentioned above. Of course, same processing may be performed in the plane of incidence in which such a filter does not exist.

[0079] In addition, as adhesives, although use of ultraviolet curing mold adhesives was explained, adhesives other than this may be used. For example, if hot melt type adhesives are used and it is made to perform adhesion immobilization of the fixed frame plate 82, and adhesion immobilization of a wedge 85, it is not necessary to take into consideration a problem with the above-mentioned filter.

[0080] In this example, while using two wedges 85 for positioning, they are attached in the mid gear of the vertical direction of the right-and-left both sides in dust prevention member 7R and the middle frame board 81, and adhesion immobilization is carried out. If the adhesion fixed position of a wedge 85 is not suitable, it originates in heat deformation of dust prevention member 7R, the middle frame board 81, or a wedge 85, and there is a possibility that superfluous stress concentration may occur in each part material. Moreover, a possibility that a wedge 85 may exfoliate from dust prevention member 7R or the middle frame board 81 is also in eye others. However, as mentioned above, adhesion immobilization of the wedge 85 has been carried out at the mid gear on either side, and the heat deformation to the vertical direction of dust prevention member 7R and the middle frame board 81 is free focusing on this part. Therefore, since the restricted degree of heat deformation of these frame boards is low, evils, such as exfoliation of stress concentration [**** / un-] and a wedge, are avoidable.

[0081] Furthermore, the wedge 85 of this example has formed two foramen-cecum-ossis-forntalis 85c in the tooth-back 85b so that drawing 11 may show. Such foramen-cecum-ossis-forntalis 85c functions as the engagement section for chucking, when carrying out chucking of the wedge 85 and dealing with it using a fixture. If such foramen-cecum-ossis-forntalis 85c is formed, the chucking can be simplified, therefore anchoring actuation will become easy.

[0082] In addition, in this example, foramen-cecum-ossis-forntalis 85c of the engagement section at the time of chucking is formed in the tooth back of a wedge 85. The engagement section for chucking may be formed in members other than this. For example, the engagement sections for chucking, such as foramen cecum ossis forntalis, may be formed in the external surface of dust prevention member 7R.

[0083] Here, in the above-mentioned projection mold display 1, by dust prevention member 7R, while holding liquid crystal panel 5R and polarizing plates 6R and 8R, between the optical plane of incidence of liquid crystal panel 5R and polarizing plate 6R and between the optical outgoing radiation side of liquid crystal panel 5R and polarizing plate 8R are intercepted with the exterior. When there is very little dust diffused in the optical plane-of-incidence side of liquid crystal panel 5R, as it is instead shown at drawing 12 , while holding only liquid crystal panel 5R and polarizing plate 8R by dust prevention member 71R, between these may be intercepted with the exterior. Of course, it is possible to use the dust prevention members 71G and 71B of the same configuration as dust prevention member 71R also about other liquid crystal panels 5G and 5B and polarizing plates 8G and 8B.

[0084] Moreover, when there is very much calorific value of polarizing plate 6R arranged at the optical plane-of-incidence side of liquid crystal panel 5R, as shown in drawing 13 , transparence plate 10R which consists of glass, plastics, etc. between liquid crystal panel 5R and polarizing plate 6R is arranged. And what is necessary is just to intercept between the optical outgoing radiation side of liquid crystal panel 5R, and polarizing plate 8R, and between the optical plane of incidence of liquid crystal panel 5R, and transparence plate 10R with the exterior, while holding liquid crystal panel 5R, polarizing plate 8R, and transparence plate 10R by dust prevention member 72R. If it does in this way, since transparence plate 10R will intervene between polarizing plate 6R and liquid crystal panel 5R in addition to an air space, generation of heat of polarizing plate 6R transmitted to liquid crystal panel 5R can be reduced more. In addition, while forming the transparence plates 10G and 10B also to liquid crystal panels 5G and 5B, of course, the same dust prevention members 72G and 72B as dust prevention member 72R may be used.

[0085] Furthermore, when possibility that dust etc. will adhere to the optical plane of incidence of a liquid crystal panel according to factors, such as airstream formed in the interior of equipment, is high, while holding only a liquid crystal panel and the polarizing plate arranged at the optical plane-of-incidence side by the dust prevention member, it is also possible to intercept between the optical plane of incidence and polarizing plate with the exterior. That is, the configuration which does not hold the polarizing plate arranged at the optical outgoing radiation side side of a liquid crystal panel by the dust prevention member may be adopted.

[0086] Although what has the property which penetrates one polarization light and absorbs the polarization light of another side as a polarizing plate is used in the above-mentioned example here, it is also possible to use the polarizing plate of the reflective mold which reflects the polarization light of another side. Since the polarizing

plate of a reflective mold has little absorption of light and there is also little calorific value, if the polarizing plate of a reflective mold is used, the temperature rise of the liquid crystal panel resulting from generation of heat of a polarizing plate can be controlled more. Since the polarizing plate of a reflective mold reflects an unnecessary polarization light, when the polarizing plate arranged at the optical outgoing radiation side side of a liquid crystal panel is used as a reflective mold, the light reflected with the polarizing plate reaches a liquid crystal panel, and there is a possibility that the liquid crystal panel concerned may malfunction by the reflected light. In order to prevent such malfunction certainly, it is desirable to use as a reflective mold the polarizing plate arranged at the optical plane-of-incidence side of a liquid crystal panel.

[0087] [the gestalt of other operations] — not only the above mentioned [display / with which this invention was applied although the above-mentioned example explained the projection mold display equipped with the liquid crystal panel of three sheets which modulates the light of three colors, respectively / projection mold] but a liquid crystal panel — two or less sheets — or four or more sheets may be used.

[0088]

[Effect of the Invention] He is trying to intercept with the exterior between the polarizing plates arranged by the dust prevention member at this optical optical outgoing radiation side [of a light modulation element], and outgoing radiation side side in the projection mold display of this invention, as explained above. Thereby, since an air space is constituted among them, compared with the case where direct attachment of the polarizing plate is carried out in the optical outgoing radiation side of a light modulation element, generation of heat of the polarizing plate transmitted to a light modulation element can be reduced. Therefore, in order to raise the contrast of a projection image, even if it is the case where the polarizing plate excellent in the selection property is used, degradation of the optical property of the light modulation element resulting from generation of heat of a polarizing plate can be prevented.

[0089] Moreover, even if dust etc. is spread by the airstream formed in the interior of equipment in order to cool a polarizing plate since the air space constituted between the optical outgoing radiation side of a light modulation element and a polarizing plate is intercepted with the exterior, dust etc. does not invade into the air space concerned. For this reason, it can prevent that dust etc. adheres to the optical outgoing radiation side of a light modulation element.

[0090] Therefore, without inviting degradation of an optical property to the light modulation element resulting from generation of heat of a polarizing plate according to the projection mold display of this invention, moreover, dirt adhesion in the optical outgoing radiation side of a light modulation element is prevented, and the high-definition image excellent in contrast can be projected.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline top view showing the configuration of the projection mold display which applied this invention.

[Drawing 2] It is the explanatory view showing the integrator illumination-light study system which illuminates the liquid crystal panel of three sheets which is the lighting field of the projection mold display shown in drawing 1 .

[Drawing 3] It is the front view and side elevation showing the appearance of the 1st optical element.

[Drawing 4] It is the perspective view showing the appearance of a polarization sensing-element array.

[Drawing 5] It is the explanatory view showing the function of a polarization sensing-element array.

[Drawing 6] It is the top view of a gobo.

[Drawing 7] It is the top view taking out and showing a liquid crystal panel and its circumference part.
[Drawing 8] It is the outline cross-section block diagram of a dust prevention member.
[Drawing 9] It is an outline flat-surface block diagram when seeing a dust prevention member from an optical plane-of-incidence side.
[Drawing 10] It is an outline flat-surface block diagram when seeing a dust prevention member from an optical outgoing radiation side side.
[Drawing 11] It is the decomposition perspective view showing signs that a dust prevention member is attached in a cross dichroic prism.
[Drawing 12] Drawing 7 is the top view showing a different example.
[Drawing 13] Drawing 12 is the top view showing a further different example.
[Drawing 14] It is the outline block diagram showing the optical system included in the optical unit of the conventional projection mold display.
[Description of Notations]
1 Projection Mold Display
2 Light Source Unit
3 Optical Unit
4 Projection Lens
5R, 5G, 5B Liquid crystal panel
6R, 6G, 6B Polarizing plate
8R, 8G, 8B Polarizing plate
7R, 7G, 7B Dust prevention member
20 Light Source
30 Integrator Optical System
40 Color Separation Optical System
50 Light Guide Optical System
60 Cross Dichroic Prism
71R, 71G, 71B Dust prevention member
72R, 72G, 72B Dust prevention member
73 1st Outer Frame
74 2nd Outer Frame
75 Cheek Middle Flask
81 Middle Frame Board
82 Fixed Frame Plate

[Translation done.]